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IS 7785-5-1 (1981): Elevated type aerodrome lighting fittings, Part 5: Approach lighting fittings, Section 1: High intensity elevated approach lighting fittings [ETD 24: Illumination Engineering and Luminaries]



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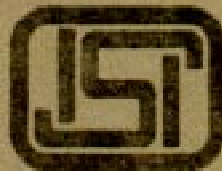
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Indian Standard
SPECIFICATION FOR
ELEVATED TYPE AERODROME
LIGHTING FITTINGS

PART V APPROACH LIGHTING FITTINGS
Section I High Intensity Elevated Approach Lighting Fittings

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Indian Standard

SPECIFICATION FOR ELEVATED TYPE AERODROME LIGHTING FITTINGS

PART V APPROACH LIGHTING FITTINGS

Section I High Intensity Elevated Approach Lighting Fittings

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(Continued on page 2)

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Indian Standard
**SPECIFICATION FOR
ELEVATED TYPE AERODROME
LIGHTING FITTINGS**

PART V APPROACH LIGHTING FITTINGS

Section I High Intensity Elevated Approach Lighting Fittings

0. FOREWORD

0.1 This Indian Standard (Part V/Sec 1) was adopted by the Indian Standards Institution on 18 March 1981, after the draft finalized by the Illuminating Engineering Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard is intended to deal with specific requirements of the high intensity elevated approach lighting fittings, in order to ensure their safe performance, good construction and high class of workmanship.

0.3 This standard (Part V/Sec 1) is one of the series of Indian Standards on elevated type aerodrome lighting fittings. The other parts of the series so far published are as follows:

Part I General requirement,

Part II Fixed focus high intensity bi-directional runway edge lighting fittings,

Part III Low intensity runway edge lighting fittings, and

Part IV Angle of approach lights, Section I Visual approach slope indicators.

0.4 This standard shall be read in conjunction with IS : 7785 (Part I) - 1975*.

0.5 In the preparation of this standard, assistance has been derived from the following publications:

a) International standards and recommended practices — Aerodromes Annex 14 (1976). Ed 7. International Civil Aviation Organization.

b) Aerodrome design manual, Part 4, Visual aids. Ed 1. 1976. International Civil Aviation Organization.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

- c) BS 3224: Section B1: 1970 Specification for lighting fittings for civil land aerodromes, Part B Approach lights, Section B1 High intensity elevated approach lighting fittings. British Standards Institution.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in the standard.

1. SCOPE

1.1 This standard (Part V/Sec 1) specifies requirements for the photometric performance and the essential mechanical and electrical features (excluding lamps) of high intensity elevated fittings with uni-directional light distributions for aerodrome approach lighting.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 1885 (Part XVI/Sec 1) - 1968† and IS : 1885 (Part XVI/Sec 2) - 1968‡ shall apply.

3. CONDITIONS OF USE

3.1 The luminaires shall be suitable for use on systems with a voltage not greater than 50 V dc or ac (rms) to earth.

3.2 Environmental Requirements — The equipment shall be designed for outdoor installation and continuous operation, and shall meet all specification requirements while operating under the following environmental conditions.

3.2.1 Temperature — A temperature range from -20°C to $+55^{\circ}\text{C}$.

3.2.2 Altitude — Any altitude from sea level to 3 050 m above sea level.

3.2.3 Humidity — A humidity range from 10 percent to 95 percent at $+55^{\circ}\text{C}$ ambient temperature.

3.2.4 Sand and Dust — Exposure to airborne and particles encountered on deserts or the result of air blast from jet aircraft.

*Rules for rounding off numerical values (revised).

†Electrotechnical vocabulary: Part XVI Lighting, Section 1 General aspects.

‡Electrotechnical vocabulary: Part XVI Lighting, Section 2 General illumination lighting fittings and lighting for traffic and signalling.

3.2.5 Salt Spray — Exposure to a salt-laden atmosphere.

3.3 The luminaires shall be designed to withstand wind speeds of 150 km/h without undue deflection and shall withstand the test specified in 6.11.

4. DETAILED REQUIREMENTS**4.1 Light Distribution**

4.1.1 The luminaires, when equipped with a lamp or lamps of light output and dimensions recommended by the luminaires manufacturer, shall give either a white light distribution of the type shown by the isocandela contours in Fig. 1 or a red light distribution of the type shown by the isocandela contours in Fig. 2, as specified by the purchaser. The centre of the beam may require to be preset between 4.5 and 6° above the horizontal.

4.1.2 The criteria of compliance with the white light distribution requirements are that the minimum intensity within the inner and outer contours of Fig. 1 shall be not less than 10 000 cd and 1 000 cd respectively. The average intensity within the inner contour shall be not less than 20 000 cd. The intensity within the inner contour should be nowhere less than half the average intensity.

4.1.3 The criteria of compliance with the red light requirements are that the minimum intensity of red light (*see* 4.3) within the inner and outer contours of Fig. 2 shall be not less than 2 500 cd and 250 cd respectively. The average intensity within the inner contour shall be not less than 5 000 cd. The intensity within the inner contour should be nowhere less than half the average intensity.

4.2 Uniformity Between Luminaire — In any direction relative to the nominal beam direction, the intensity shall not vary by more than 2 : 1 from luminaire to luminaire within the solid angle shown in Fig. 1 and using the recommended lamp.

4.3 Colour

4.3.1 The luminaire when supplied to emit red light shall emit aviation red light as specified in 5.1 of IS : 7785 (Part I) - 1975*, for a light source whose colour temperature is that of the lamp or lamps, at nominal lumen output, recommended by the manufacturer. The distribution of the coloured light shall comply with the requirements of 4.1.

4.3.2 The colour media used shall comply with the requirements of 6.4 and 6.5 and shall be capable of withstanding without deterioration the range of conditions described in 3.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

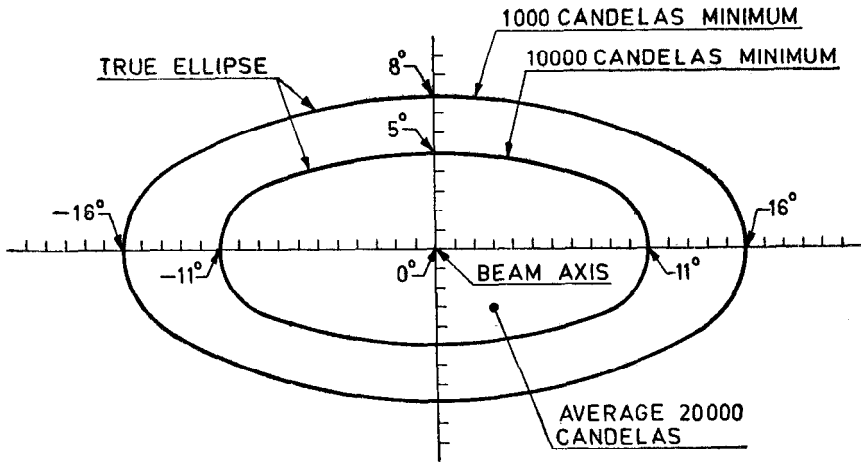


FIG. 1 WHITE LIGHT DISTRIBUTION

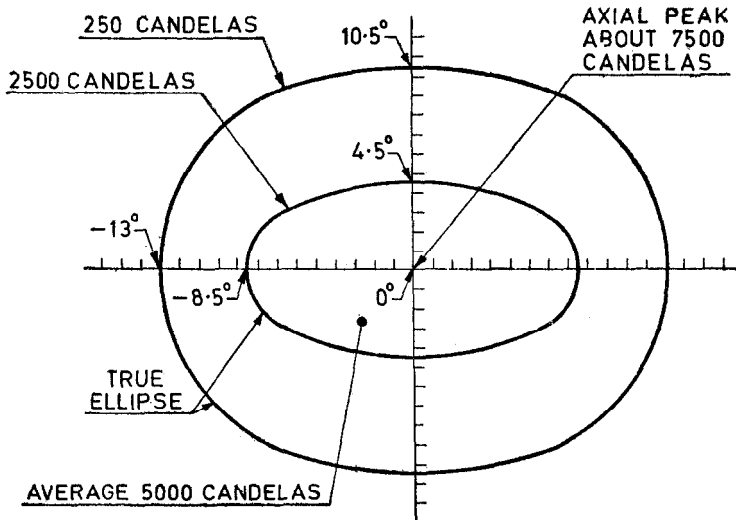


FIG. 2 RED LIGHT DISTRIBUTION

4.4 Mounting—The luminaires shall be arranged for mounting on a vertical spigot consisting of a tube threaded externally. The spigot shall not be considered to be part of the luminaire.

NOTE—The maximum mounting height of the luminaires above ground level is under consideration.

4.5 Frangibility — Guidance on the frangibility of approach lights is more difficult to develop, as there is a greater variation in their installation. Conditions surrounding installations close to the threshold are different from those near the beginning of the system; for example, lights within 90 m of the threshold or runway end are required to withstand a 200 knot blast effect, whereas lights further out only need withstand a 100 knot blast or the natural environment wind load. Also the terrain close to the threshold can be expected to be near the same elevation as the threshold, thus permitting the lights to be mounted on short structures. Further from the threshold, support structures of considerable height may be required.

4.5.1 The luminaire shall pass the frangibility requirements given in 6.10.

4.6 Adjustment for Alignment of Beam — Simple means of lockable adjustment shall be provided, for use in conjunction with a removable sighting device, to compensate for errors of up to $\pm 5^\circ$ in the mounting spigot and additionally to permit the elevation of the beam up to 6° above the horizontal and adjustment of the beam in azimuth of $\pm 8^\circ$. It shall be possible to make these adjustments within an accuracy of $\pm 0.25^\circ$.

4.7 Aiming Instrument Set

4.7.1 Aiming Bar — The aiming bar shall be an accurate alignment instrument that can be operated by one person. It shall be constructed of aluminium and shall be a light weight, rugged instrument designed to permit adjustment of the optical centre line of the lamp housing to the desired vertical angle. Design and construction shall be such that, when the instrument is supported on the two surfaces, deviation from true position due to its own weight shall not exceed 3 minutes of arc. A dial shall be provided for setting the desired angle and shall indicate from 0 to 6 degree in increments of 1 minute. The spacing between each degree mark shall be at least 1.0 cm. Alternative designs, using a vernier dial, may be used where provided with equivalent gradations as specified for the direct reading dial. The bar shall be so designed that repeated changes of the dial setting will not cause excessive wear and deterioration of the instrument's accuracy. Aluminium and other soft metals shall not be used where subjected to metal to metal rubbing. The aiming bar shall utilize a 15 cm level having an accuracy of ± 2 minutes. The level shall be permanently mounted on the aiming bar to permit fine adjustment in calibrating the instrument. The level shall have a protective device to minimize possible damage. Operating instructions shall be permanently provided on the bar.

4.7.2 Calibration Bar — The calibration bar shall be constructed of aluminium of a shape, size and thickness to provide a rigid and accurate checking instrument. The calibration bar shall be designed for lying on a flat surface or in the carrying case and shall have adjustment features to permit its being levelled to a horizontal plane. A level, attached to the bar, shall be provided with each calibration bar to permit levelling. The

level shall be of the same type as used on the aiming bar (*see* 4.7.1). The calibration bar shall have devices comparable to the transition bar and aperture of the lamp housing, so that the aiming bar can be mounted thereon and accurately adjusted. Operating instructions shall be permanently provided on the bar.

4.8 Focusing — Focusing of the luminaires shall be fixed and it shall not be possible to throw it out of adjustment inadvertently during installation when renewing lamps or performing other maintenance operations.

4.9 Glasses and Transparent Parts — Outer glasses shall be suitable for the temperature gradients to which they will be subjected under the conditions specified in 3 and shall withstand the tests specified in 6.4 and 6.5.

The materials used shall be capable of withstanding, without distortion, the full range of operating temperatures attained in ambient temperatures of between -20°C and $+55^{\circ}\text{C}$.

4.10 Fastening of Covers — Covers which require to be opened or removed for the adjustment of the luminaires, lamp changing, etc, shall be secured by strong fastenings which are easily operated without the use of special tools. Fastenings and gaskets shall be captive, either on the body of the luminaire or on the removable cover.

4.11 Drainage — The luminaires shall be so constructed that any water entering them drains away without coming into contact with the lamp, reflecting surfaces or electrical connections.

4.12 Protection Against Corrosion — All parts shall have adequate resistance to corrosion and suitable precautions shall be taken to prevent electrochemical corrosion between parts of different metals.

All external parts and surfaces shall have a suitable surface finish to withstand the effects of corrosion and the whether conditions referred to in 3.

4.13 External Finish — The external surface of the body of the luminaires shall be finished in yellow colour (No. 355 of IS : 5-1978*).

4.14 Electrical Connections

4.14.1 Cable Entry — Provision shall be made for the entry of an insulated cable, sheathed or armoured, to the purchaser's requirements.

Means shall be provided for clamping the cable so as to prevent strain and twisting of the ends of the conductors connected to the terminals.

4.14.2 Terminals — Terminals shall be provided for connecting conductors up to 6 mm^2 .

*Specification for colours for ready mixed paints and enamels (*third revision*).

4.15 Lampholders

4.15.1 All metal parts of the lampholders shall be fabricated from a nonferrous metal or some other suitable material. Copper beaming hardware in contact with aluminium shall be cadmium, nickel or zinc plated. The following provisions shall also be made:

- a) A drain hole shall be provided in the lampholder to drain off any accumulation of water due to condensation.
- b) A threaded swivel stem-mounting shall be provided for mounting the lampholder on the horizontal pipe mounting bar.
- c) Means shall be provided in the lampholder to obtain a water-proof seal for the prefocus/sealed beam type of lamps when in place.
- d) A suitable vertical aiming device shall be provided which will permit the aiming of each lampholder and/or the entire lamp bar at any angle from 0 to + 15 degrees. The scale on the device shall have 1 degree divisions from 0 to 15 degrees. A zero degree horizontal reference or aiming device shall also be provided for each lampholder.

4.15.2 The position of the lampholder with respect to the optical system shall be fixed and it shall not be possible to alter it inadvertently during installation, when renewing lamps, or performing other maintenance operations.

4.15.3 All materials used in the construction of the lampholder shall be capable of withstanding without deterioration the temperature reached under the most adverse operating conditions specified in 3 and with the recommended lamp.

4.16 Insulation — The insulation of live parts shall be capable of passing the test specified in 6.8.

Insulating materials shall be non-hygroscopic and capable of withstanding indefinitely without deterioration the temperature reached under the operating conditions specified in 3.

5. MARKING

5.1 Information to be Marked — Each luminaire shall be suitably and clearly marked with the following information:

- a) Manufacturer's name or trade-mark or both,
- b) Model or type designation, and
- c) Country of manufacture.

5.2 Method of Marking — Marking shall be legible and indelible and shall be made either on the luminaire itself or on a name plate securely fixed thereto.

NOTE — The performance of marking is checked by inspection or by rubbing lightly with a piece of cloth, or by both methods.

5.3 A complete list of parts and installation instructions shall be furnished with each luminaire. Sufficient drawings or instructions shall be provided to indicate clearly the method of installation.

5.4 The luminaires may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. TESTS

6.1 Classification of Tests

6.1.1 Type Tests — The following shall constitute type tests:

- a) Visual examination (*see 6.2*),
- b) Photometric test (*see 6.3*),
- c) Test for resistance to heat (*see 6.4*),
- d) Test for temperature shock (*see 6.5*),
- e) Test for temperature rise (*see 6.6*),
- f) Rain-proof test (*see 6.7*),
- g) Insulation resistance (dry) test (*see 6.8*),
- h) High voltage test (*see 6.9*),
- j) Frangibility test (*see 6.10*), and
- k) Wind pressure test (*6.11*).

6.1.1.1 For carrying out type tests the manufacturer shall submit to the testing authority three samples, preferably selected at random from regular production lots, together with relevant technical data as required.

6.1.1.2 Criteria for approval — The testing authority shall issue a type approval certificate, if the luminaires are found to comply with the requirements of the test. In case of failure in any of the tests, the testing authority shall call for fresh samples not exceeding twice the number of

original samples and subject them to all the tests. If in the repeat tests no failure occurs, the test may be considered to have been satisfied.

6.1.2 Acceptance Tests — The following shall constitute acceptance tests:

- a) Visual examination (*see* 6.2),
- b) Rain-proof test (*see* 6.7),
- c) Insulation resistance (dry) test (*see* 6.8), and
- d) High voltage test (*see* 6.9).

6.1.2.1 For carrying out acceptance tests, the sampling procedure and criteria of acceptance shall be subject to agreement between the supplier and the purchaser. However, a recommended sampling plan which may be followed in the absence of such an agreement is given in Appendix A.

6.1.3 Routine Tests — The following constitute routine tests:

- a) Visual examination (*see* 6.2),
- b) Insulation resistance (dry) test (*see* 6.8), and
- c) High voltage test (*see* 6.9).

6.2 Visual Examination — Luminaires shall not have any visible sign of damage. Compliance is checked by visual examination.

6.3 Photometric Tests — The luminaires shall be tested in accordance with 5.8.2 of IS : 7785 (Part I) - 1975* for compliance with the requirements of 4.1 and 4.2 using the lamp recommended at its nominal lumen output. Reading shall be taken at 2° intervals in both elevation and azimuth and in sufficient detail to establish compliance with 4.1 and 4.2.

NOTE — To prove the uniformity requirement of 4.2, the same lamp may be used in several luminaires.

6.4 Test for Resistance to Heat — The provisions of 5.8.3 of IS : 7785 (Part I)-1975* shall apply.

6.5 Test for Temperature Shock — The provisions of 5.8.4 of IS : 7785 (Part I)-1975* shall apply.

6.6 Test for Temperature Rise — The provisions of 5.8.5 of IS : 7785 (Part I)-1975* shall apply.

6.7 Rain-proof Test — The provisions of 5.8.6 of IS : 7785 (Part I)-1975* shall apply.

6.8 Insulation Resistance (Dry) Test — The provisions of 5.8.7 of IS : 7785 (Part I)-1975* shall apply.

6.9 High Voltage Test — The provision of 5.8.8 of IS : 7785 (Part I)-1975* shall apply.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

6.10 Frangibility Test — The luminaires and supports shall fail when an impact load of not more than 5 kgm and a static load of not less than 230 kg is applied horizontally at 30 cm above the break point of the structure.

6.11 Wind Pressure Test — The luminaire shall be mounted on a rigid horizontal test spigot tube with its maximum projected area lying in a horizontal plane. A distributed load of 2.4 kN/m² shall be applied, preferably by means of sand bags of suitable weight, for a period of 10 minutes. The test shall be repeated with the fitting turned through 180° about the axis of the spigot.

The luminaire shall be deemed acceptable if there is no failure, or movement at the point of attachment and no deflection exceeding 1°.

A P P E N D I X A

(Clause 6.1.2.1)

SAMPLING PROCEDURE

A-1. SCALE OF SAMPLING

A-1.1 Lot — All the lighting fittings of the same type manufactured using the same raw material under similar conditions of production shall be grouped together to constitute a lot.

A-1.2 The number of lighting fittings to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

TABLE 1 SAMPLE SIZES AND ACCEPTANCE NUMBERS

LOT SIZE	SAMPLE SIZE	ACCEPTANCE NUMBER
(1)	(2)	(3)
Up to 50	8	0
51 to 100	13	0
101 to 150	20	1
151 to 300	32	1
301 to 500	50	2
501 to 1 000	80	3
1 001 and above	125	5

A-1.2.1 These fittings shall be selected from the lot at random. To ensure the randomness of selection, procedures given in IS : 4905 - 1968* may be followed.

A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 The lighting fittings, selected at random according to col 1 and 2 of Table 1, shall be subjected to the acceptance tests specified in 6.1.2. A fitting failing to satisfy any of the acceptance tests shall be termed as defective. The lot shall be considered as conforming to the requirements, if the number of defectives found in the samples is less than or equal to the corresponding acceptance number; otherwise the lot shall be rejected.

*Methods for random sampling.

INDIAN STANDARDS

ON

ILLUMINATING ENGINEERING

IS:

- 1777-1978 Industrial luminaire fittings with metal reflectors (*first revision*)
- 1885 (Part XVI/Sec 1)-1968 Electrotechnical vocabulary: Part XVI Lighting, Section 1 General aspects
- 1885 (Part XVI/Sec 2)-1968 Electrotechnical vocabulary: Part XVI Lighting, Section 2 General illumination, lighting fittings and lighting for traffic and signalling
- 1913 (Part I)-1978 General and safety requirements for luminaires: Part I Tubular fluorescent lamps (*second revision*)
- 1944 (Parts I & II)-1970 Code of practice for lighting of public thoroughfares (*first revision*)
- 1944 (Part V)-1981 Code of practice for lighting of public thoroughfares: Part V Lighting for grade separated junctions, bridges and elevated roads (Group D)
- 1944 (Part VII)-1981 Code of practice for lighting of public thoroughfares: Part VII Lighting for roads with special requirements (Group F)
- 1947-1980 Flood lights (*first revision*)
- 2149-1970 Luminaires for street lighting (*first revision*)
- 2206 (Part I)-1962 Flameproof electric lighting fittings: Part I Well-glass and bulkhead types
- 2206 (Part II)-1976 Flameproof electric lighting fittings: Part II Fittings using glass tubes
- 2493-1963 Well-glass lighting fittings for use underground in mines (non-flameproof type)
- 2672-1966 Code of practice for library lighting
- 3287-1965 Industrial lighting fittings with plastic reflectors
- 3528-1966 Waterproof electric lighting fittings
- 3553-1966 Watertight electric lighting fittings
- 3646 Code of practice for interior illumination:
(Part I)-1966 Principles of good lighting and aspects of design
(Part II)-1966 Schedule for values of illumination and glare index
(Part III)-1968 Calculation of coefficients of utilization by the BZ method
- 4012-1967 Dust-proof electric lighting fittings
- 4013-1967 Dust-tight electric lighting fittings
- 4347-1967 Code of practice for hospital lighting
- 5077-1969 Decorative lighting outfits
- 6585-1972 Screwless terminal and electrical connections for lighting fittings
- 6665-1972 Code of practice for industrial lighting
- 7537-1974 Road traffic signals
- 7569-1975 Cast acrylic sheets for use in luminaires
- 7678-1975 Method of photometric testing of incandescent type luminaires for general lighting service
- 7785 Elevated type aerodrome lighting fittings:
(Part I)-1975 General requirements
(Part II)-1976 Fixed focus high intensity bi-directional runway edge lighting fittings
(Part III)-1976 Low intensity runway edge lighting fittings
(Part IV/Sec 1)-1981 Angle of approach lights, Section 1 Visual approach slope indicators
(Part V/Sec 1)-1981 Approach lighting fittings, Section 1 High intensity elevated approach lighting fittings
- 8030-1976 Luminaires for hospitals
- 8224-1976 Electric lighting fittings for division 2 areas
- 9583-1981 Emergency lighting units

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamle temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg. m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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 Southern : C. I. T. Campus, Adyar
 Northern : B69, Phase VII

Telephone
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Branch Offices:

'Pushpak', Nurmohamed Shalkh Marg, Khanpur
 'F' Block, Unity Bldg, Narasimharaja Square
 Gangotri Complex, Bhadbhade Road, T. T. Nagar
 22E Kalpana Area
 5-8-56C L. N. Gupta Marg
 R 14 Yudhister Marg, C Scheme
 117/418 B Sarvodaya Nagar
 Patliputra Industrial Estate
 Hantex Bldg (2nd Floor), Rly Station Road

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 BHOPAL 462003 6 27 16
 BHUBANESHWAR 751014 5 36 27
 HYDERABAD 500001 22 10 83
 JAIPUR 302005 6 98 32
 KANPUR 208005 4 72 92
 PATNA 800013 6 28 08
 TRIVANDRUM 695001 32 27